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### **REMARKS**

Applicant gratefully acknowledges the Examiner's comments made in a telephone interview conducted on February 17, 2004. Applicant notes that during the interview, the Examiner and Applicant's undersigned representative discussed the claimed invention, especially the claimed invention as defined in claims 1 and 2. Specifically, Applicant's undersigned representative pointed out the differences and patentable distinctions between the claimed invention and the Shakuda '029 reference.

Entry of this Amendment is proper because it narrows the issues on appeal and does not require further search by the Examiner.

Claims 1-22 are all the claims presently pending in the application. Claims 1 and 2 have been amended to more particularly define the invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-22 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Shakuda (U.S. Patent No. 5,838,029).

These rejections are respectfully traversed in the following discussion.

#### **I. THE CLAIMED INVENTION**

The claimed invention (as recited in the exemplary embodiment of claim 1) is directed to a group III nitride compound semiconductor light-emitting device which includes a semiconductor laminate portion including a light-emitting layer, and a reflection surface disposed so as to be opposite to a side surface of the light-emitting layer. Further, the semiconductor laminate portion and the reflection surface are provided in the same chip.

The Background section of the present Application describes devices which include a reflection surface which is not provided on the same chip (e.g., Application at Figure 4B). In such devices, a large distance (e.g., 200-300  $\mu\text{m}$ ) separates the side surface of the light-emitting layer and the reflection surface. Therefore, the light component reflected is a light component within a very small angle (Application at page 22, lines 1-9).

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The claimed invention, on the other hand, includes a reflection surface which is opposite to a side surface of the light-emitting layer and which is provided in the same chip as the semiconductor laminate portion (Application at page 3, line 10-page 4, line 3; Figures 2B, 4A and 6B). These novel features of the claimed invention allow the device to be easily fabricated and effectively utilize the light emitted from the side surface of the semiconductor laminate portion.

## II. THE SHAKUDA REFERENCE

The Examiner alleges that Shakuda teaches the claimed invention of claims 1-22. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by Shakuda.

Shakuda discloses a light emitting device which includes stacked gallium nitride type compound semiconductor layers. The device is intended to have an enhanced luminous efficiency and life by suppressing the occurrence of crystal defects or dislocations due to mismatching of a lattice constant (Shakuda at col. 3, lines 21-28).

Applicant submits, however, that Shakuda does not teach or suggest *"a reflection surface disposed so as to be opposite to a side surface of said light-emitting layer"* as recited, for example, in claims 1 and 8.

The Background section of the present Application describes devices which include a reflection surface which is not provided on the same chip (e.g., Application at Figure 4B). In such devices, a large distance (e.g., 200-300  $\mu\text{m}$ ) separates the side surface of the light-emitting layer and the reflection surface. Therefore, the light component reflected is a light component within a very small angle (Application at page 22, lines 1-9).

The claimed invention, on the other hand, includes a reflection surface which is opposite to a side surface of the light-emitting layer and which is provided in the same chip as the semiconductor laminate portion (Application at page 3, line 10-page 4, line 3; Figures 2B, 4A and 6B). This allows the claimed invention to be easily fabricated and effectively utilize the light emitted from the side surface of the semiconductor laminate portion (Application at page 3, lines 4-9; page 4, line 4-page 5, line 4). Specifically, the Application states that with the claimed invention,

Clearly, these features are not taught or suggested by the Shakuda reference. Indeed,

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as noted above, Shakuda is intended to improve a luminous characteristic by suppressing the occurrence of crystal defects or dislocations due to mismatching of a lattice constant. This is completely unrelated to the claimed invention which may improve luminous efficiency by forming a reflection surface in the same chip as the semiconductor laminate portion.

The Examiner surprisingly attempts to rely on Figure 1(d) of Shakuda to support her allegations. However, Figure 1(d) merely shows two stacks of semiconductor layers which are separated by an etched portion. That is, the drawing is merely used in Shakuda to illustrate a step in the process of forming light-emitting devices.

In fact, Applicant would point out that Shakuda describes Figures 1(a)-1(f) as "illustrating steps of producing a semiconductor light emitting device" (Shakuda at col. 7, lines 44-46) (emphasis added). In other words, Figure 1(d) does not show a completed light-emitting device but merely an intermediate step in producing a device.

Indeed, Shakuda discloses a method in which stacked semiconductor layers are etched to form many light-emitting devices (Shakuda at col. 8, lines 8-67). The structure is then "diced" into separate structures to form many individual light-emitting devices. Applicant submits, for example, that Shakuda teaches that a p-side electrode 29 and n-side electrode 30 are formed on the structure of Figure 1(d) in Shakuda to form the structure of Figure 1(e). Then, Shakuda states that "[t]his is followed by dicing to produce an LED chip form shown in FIG. 2" (Shakuda at col. 8, lines 56-57).

In other words, the structure of Figure 1(d) is diced to form the final LED structure which is illustrated in Figure 2. Presumably, the Examiner alleges that a side surface of one stack of semiconductor layers in Figure 1(d) faces the adjacent stack and, therefore, the Examiner alleges that the side surface is equivalent to the reflection surface of the claimed invention. However, this is clearly incorrect.

Indeed, Applicant points out that the stacks of semiconductor layer are separated by the dicing step between Figures 1(e) and 1(f). Therefore, in the finished light-emitting device, the stacks are not formed adjacent to each other. Thus, there is no surface formed opposite to the light-emitting layer to serve as a reflection surface.

Shakuda states that "the end surfaces are finished to be smooth and favorable quality mirror surfaces" (Shakuda at col. 8, lines 51-52). The Examiner surprisingly makes reference to the term "mirror surfaces" in this passage as somehow suggesting the reflection surface of

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the claimed invention. However, the “end surfaces” referred to in this passage means the **“end surfaces of the semiconductor light-emitting device”** (Shakuda at col. 8, lines 45-47) (emphasis added). In other words, Shakuda teaches that the side surfaces (e.g., “end surfaces”) of the light-emitting device has a “mirror surface”, not that a surface opposite to the side surface has a “mirror surface”. Thus, Shakuda clearly does not teach or suggest the reflection surface of the claimed invention, let alone a reflection surface which is formed on the same chip as the semiconductor laminate portion.

Further, Applicant points out that in an exemplary embodiment of the claimed invention, a purpose of the reflection surface is to reflect light which is transversely emitted from the semiconductor laminate portion “in the direction of the center axis (optical axis)” (Application at page 3, lines 22-25). Shakuda, on the other hand, teaches that a semiconductor laser that “acts as a resonator provided with two opposite mirror end surfaces thus increasing the efficiency of light emission” (Shakuda at col. 9, lines 44-46). More specifically, it is intended that light output from the active layer 26 “proceeds parallel to the surface of the substrate” (Shakuda at col. 9, lines 47-48) (emphasis added).

In other words, Shakuda intends for light to be emitted from the side surface of the active layer. Therefore, there is no need for a reflecting surface to redirect the light. Indeed, such a reflection surface formed opposite to the side surface of the active layer would necessarily hinder the operation of the Shakuda device.

Further, as Applicant’s undersigned representative pointed out in the above-referenced telephone interview, it is nonsense to equate the mirrored end surface of the active layer 26 in the intermediate structure in Figure 1(d) of Shakuda with a “reflection surface” in the claimed invention, since the mirrored end surface does not reflect light emitted from the active layer. Instead, the mirrored end surface reflects light before it is emitted, in order to form a resonator.

Thus, the mirrored end surface in Shakuda has a completely different function than the reflection surface of the claimed invention and cannot reasonably be equated with the reflection surface of the claimed invention.

Therefore, Applicant submits that there are elements of the claimed invention that are not taught or suggest by Shakuda. Therefore, the Examiner is respectfully requested to withdraw this rejection.

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### III. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1-22, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 2/17/04

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### CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that the foregoing Amendment was filed by facsimile with the United States Patent and Trademark Office, Examiner Laura Schillinger, Group Art Unit # 2813 at fax number (703) 872-9306 this 17<sup>th</sup> day of February, 2004.



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